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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/696,349

10/29/2003

Vladimir Grushin

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12/19/2005

E I DU PONT DE NEMOURS AND COMPANY  
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EXAMINER

SMOOT, STEPHEN W

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 12/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/696,349

Applicant(s)

GRUSHIN ET AL

Examiner

Stephen W. Smoot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 12-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the international Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9-29-05</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

This Office action is in response to applicant's amendment filed on 29 September 2005.

### ***Specification***

1. The disclosure is objected to because of the following informality:

Update the first sentence of the specification (see amendment filed 9-29-05, page 2) to indicate that 10/027,421 has issued as US 6,670,645.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 13-15 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 01/41512 A1 (**Thompson** et al.) in view of the article by **Djurovich** et al. in Polymer Preprints 41(1), 2000, pp. 770-771.

**Thompson** discloses the general formulas for electroluminescent metal complexes for use in the light-emitting layer of a light-emitting device, as  $LL'L''M$  and  $L_2MX$  and  $L_3M$ , wherein M may be iridium (Ir) and each L, L', L'' are bidentate ligands of the variety shown in Fig. 39 and called "arylquinolines," and X is a bidentate ligand such as acetylacetonate (acac; Fig. 1) or hexafluoroacetylacetonate (p. 17). (See paragraph bridging pp. 3-4 and pp. 12 and 17). As shown in Fig. 39, each ring of the arylquinoline may be substituted with R', R'', and R'''.

The light emitting layers emit light in the range of 570 nm to 700 nm (pp. 34 and 35). Moreover, because the compounds disclosed are the same as those claimed, the emission maximum is inherently within this claimed range; otherwise, claim 21 would not be enabled by Applicant's own admission.

Regarding claim 20, because the light-emitting layer is the location where electron and hole charges are transported to recombine resulting in the emission of light, it is a charge transport layer since charge must move through this layer for the recombination.

However, **Thompson** does not teach or suggest specific substituents for R', R'', and R'''.

**Djurovich** discloses electroluminescent Ir metal complexes having ligands also disclosed in **Thompson**. (Note that each of Thompson and Djurovich are common inventor/authors on each reference). **Durovich** indicates that substituting the ring of the ligands with fluorine improves the solubility of the complex in the carrier matrix without much change to the emission spectrum (paragraph bridging pp. 770-771).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use fluorine as substituents for R', R'', and R''' in the arylquinoline rings of **Thompson**, in order to improve the solubility of the compounds for subsequent manufacture of the light-emitting device, as taught by **Djurovich**. Note that there exists no evidence of record that the location of the substituents on the ligands of the claimed compounds provides any unexpected results. Rather the instant specification and instant claim 21 broadly claims all locations on each ring are appropriate, thereby teaching away from unexpected results.

Further regarding claim 21, **Thompson** gives an exemplary amount of the Ir metal complex of 12% (Thompson, p. 30, for example). While Thompson does not give amounts greater than 20%, this feature is *prima facie* obvious without showing that the applicant's claimed range of greater than 20 weight % achieves unexpected results relative to the prior art range of **Thompson**. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In*

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*re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Accordingly, it would have been obvious for one of ordinary skill in the art, at the time of the invention to use greater than 20% of the Ir metal complex in the light-emitting layer of **Thompson** in order to increase the total amount of light that is emitted from the device.

4. Claims 12-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 01/41512 A1 (**Thompson** et al.) in view of the article **Dedeian** et al. in Inorganic Chemistry, Vol. 30, 1991, 1685-1687 and of WO 00/70655 (**Baldo** et al.).

**Thompson** discloses the general formulas for electroluminescent metal complexes for use in the light-emitting layer of a light-emitting device, as  $LL'L''M$  and  $L_2MX$  and  $L_3M$ , wherein M may be iridium (Ir) and each L, L', L'' are bidentate ligands of the variety shown in Fig. 39 and called "arylquinolines," and X is a bidentate ligand such as acetylacetonate (acac; Fig. 1) or hexafluoroacetylacetonate (p. 17). (See paragraph bridging pp. 3-4 and pp. 12 and 17). As shown in Fig. 39, each ring of the arylquinoline may be substituted with R', R'', and R'''.

The light emitting layers emit light in the range of 570 nm to 700 nm (pp. 34 and 35). Moreover, because the compounds disclosed are the same as those claimed, the

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emission maximum is inherently within this claimed range; otherwise, claim 21 would not be enabled by Applicant's own admission.

Regarding claim 20, because the light-emitting layer is the location where electron and hole charges are transported to recombine resulting in the emission of light, it is a charge transport layer since charge must move through this layer for the recombination.

Although **Thompson** does indicate that the ligands in the complex tune the color of light emitted by the complex (paragraph bridging pp. 34-35), they do not teach or suggest specific substituents for R', R'', and R'''.

**Dedeian**, like **Thompson**, discloses electroluminescent phenylpyridine ligands for Ir. **Dedeian** shows in the upper, right-hand corner of p. 1686, Table I, that the phenylpyridine can be substituted with, inter alia, fluorine and trifluoromethyl.

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use trifluoromethyl and fluorine as the R', R'', and R''' substituents on the arylquinolines ligands because, as noted above, **Thompson** suggests using various ligands to modify the emission wavelength of the Ir metal complex, and **Dedeian** teaches that trifluoromethyl and fluorine are known substituents for ligands of Ir metal complexes. Importantly, the **Thompson** and **Dedeian** references share a common author, Peter Djurovich, such that one of ordinary skill would also be aware that each group of authors/inventors were aware that the substituents of F and CF<sub>3</sub> are known ligand substituents.

**Dedeian** does not locate the substituent groups F and CF<sub>3</sub> on the phenylpyridine ligands that match those selected locations of claims 12-17, but does show that the ligands can be placed anywhere.

**Baldo**, like **Thompson** and **Dedeian**, discloses substituted phenylpyridine ligands for Ir, and teaches that the substituent groups can be located in any position on either ring of the phenylpyridine ligand. Further, **Baldo** indicates that moving the substituent group can advantageously be used to alter desirable emissive properties like "color emission" and "carrier transport rates" (**Baldo**, pp. 14-15).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to locate the substituents of **Thompson** at each specific location on the arylquinoline ring to beneficially affect the emissive properties of the Ir complex, as taught to be beneficial in **Baldo**. Note that there exists no evidence of record that the location of the substituents on the ligands of the claimed compounds provides any unexpected results. Rather the instant specification and instant claim 21 broadly claims all locations on each ring are appropriate, thereby teaching away from unexpected results.

Further regarding claim 21, **Thompson** gives an exemplary amount of the Ir metal complex of 12% (**Thompson**, p. 30, for example). While Thompson does not give amounts greater than 20%, this feature is *prima facie* obvious without showing that the applicant's claimed range of greater than 20 weight % achieves unexpected results relative to the prior art range of **Thompson**. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir.



1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use greater than 20% of the Ir metal complex in the light-emitting layer of **Thompson** in order to increase the total amount of light that is emitted from the device.

### ***Response to Arguments***

5. Applicant's arguments filed on 29 September 2005 have been fully considered but they are not persuasive.

Regarding the above rejection of claims 13-15, 17-20 as being unpatentable over the combination of **Thompson** and **Djurovich** (see pages 7-8 of applicant's remarks), the applicant argues that a person of ordinary skill in the art would not be motivated to use fluorine as a substituent because **Djurovich** teaches a decrease in emission efficiency. However, **Djurovich** teaches a slight decrease in emission efficiency and indicates that the increased solubility in organic solvents that results from using fluorine substituents far outweighs this decrease (see paragraph bridging pages

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770 and 771). Accordingly, there would be a reasonable expectation of success when applying the use of fluorine substituents, as taught by **Djurovich**, to the quinoline structure of **Thompson**. Further, the applicant argues that **Thompson** teaches away from fluorine substituents because they did not specify fluorine as a substituent.

However, **Thompson** generally discloses the use of substituents and does not specify any particular substituent, which means that they are open to any specific constituent including fluorine. **Djurovich** is used in the combination because they specifically teach the use of fluorine as a substituent that offers the advantage of increased solubility. Also, the applicant argues that neither reference teach or suggest trifluoromethyl substituents, but claims 13-15, 17-20 are not directed to trifluoromethyl constituents.

Regarding the above rejection of claim 21 as being unpatentable over the combination of **Thompson** and **Djurovich** (see page 8 of applicant's remarks), the applicant argues that this combination lacks the limitation of an emitting layer with greater than 20 weight % iridium compound. However, as indicated above and in the prior Office action, a *prima facie* case of obviousness has been established based on optimization through routine experimentation and, per MPEP section 2144.05, the applicant needs to establish that their as claimed range is critical to their invention (e.g. by a showing of unexpected results).

Regarding the above rejection of claims 12-20 as being unpatentable over the combination of **Thompson**, **Dedeian**, and **Baldo** (see pages 9-10 of applicant's remarks), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

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208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). For this combination, **Thompson** is relied upon for the quinoline structure, **Dedeian** is relied upon for the use of fluorine or trifluoromethyl as substituents, and **Baldo** is relied upon for their teaching that the use of substituents placed at any location on the ring can advantageously be used to obtain desirable emissive properties. Further, the applicant argues that **Thompson** teaches away from trifluoromethyl substituents because they did not specify trifluoromethyl as a substituent. However, **Thompson** generally discloses the use of substituents and does not specify any particular substituent, which means that they are open to any specific constituent including fluorine or trifluoromethyl. **Dedeian** is used in the combination because they specifically teach the use of fluorine or trifluoromethyl as substituents.

Regarding the above rejection of claim 21 as being unpatentable over the combination of **Thompson**, **Dedeian**, and **Baldo** (see pages 10-11 of applicant's remarks), the applicant argues that this combination lacks the limitation of an emitting layer with greater than 20 weight % iridium compound. However, as indicated above and in the prior Office action, a *prima facie* case of obviousness has been established based on optimization through routine experimentation and, per MPEP section 2144.05, the applicant needs to establish that their as claimed range is critical to their invention (e.g. by a showing of unexpected results).

***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

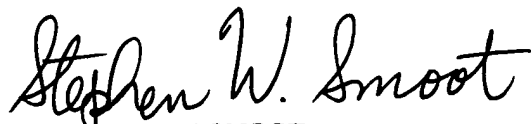
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

  
**STEPHEN W. SMOOT**  
**PRIMARY EXAMINER**